plants and the ease with which such crops are raised, should be brought out as important details in the usefulness of horses and cattle, as well as their anatomical adaptation to the work of pulling or carrying loads, and their physiological adaptations for meat and milk production.

The treatment of man as outlined would involve as much of the advanced sciences of anthropology and ethnology as one had time for; would naturally involve ancient history, in connection with grain commerce of Rome and her colonies; would take up the development of agricultural communities through the feudal system to the modern village of tenant farmers, and the rise of the freeholders, especially in the new settlements. The relation of established feast days (*e. g.*, Feast of First Fruits) of the ancient tribes, to events of the agricultural year would introduce the religious side of man, and the importance of conserving the produce of his labor, would serve to connect the ideas of property, ownership, wealth, capital and law.

The simpler relations would naturally be assigned to the earlier years of the course. Thus the subjects relating to plant life, in their fundamental details could be given in the sophomore year, supplementing the freshman work in botany; some work would likely be well retained to a later period. Soil work should follow the first year's work in chemistry and in physics, as the general properties of soils are in accordance with the principles learned in those subjects. The study of animals in relation to agriculture would be a good junior subject, as the additional year of work would make it the easier for the student to follow the course, and to grasp the essential points of structure, behavior, conditions of existence among wild and domestic animals, and similar details after he has had the less complex relationships among plants brought out in the sophomore work.

The study of the relation of man to agriculture, as suggested, should come in the senior year, in order that the work in history, economics, engineering and science may be available for use to aid in the development of the course by each man in the class bringing to it as broad a basis of work as possible. The topics introduced at this stage might easily serve as the basis of further study by the few specially interested along the lines of colonial, economic or industrial development. Frequent assignments of readings would be necessary, as the material is scattered and must be brought together under the new viewpoint.

Some suggestions have been found in several text-books on agriculture, agricultural education, farm management and similar topics, more or less along the lines here suggested, but in most cases, the discussion was from the standpoint of technical agriculture, as would be expected. Particular chapters could, however, be selected from a number of such books, to be used as collateral reading by either of the four college classes, suitably supplemented by lectures presenting the desired viewpoint, and developing the central theme. This may be briefly stated as follows: Agriculture as the oldest industrial occupation of man is the basis of all his later achievements, and supports him in his highest attainments. The course might be designated as one in "The development and scope of agriculture" and could be a lecture course supplemented by specified laboratory and class work in the several departments involved. The course might also be developed as a series of short courses, something on the plan of the "summer school" work, correlated by a carefully prepared syllabus or outline, each teacher selecting those phases of the work most closely related to agriculture in its broadest sense, and emphasizing the relation of his subject to the general topic.

Frederick H. Blodgett

SCIENTIFIC BOOKS

Psychology: General and Applied. By Hugo Münsterberg. New York and London, Appleton, 1914. Pp. xiv + 487.

Professor Münsterberg's latest work breaks away from the traditional presentation of psychology in many respects. The most novel features are the author's treatment of mental data from the teleological standpoint and the

emphasis which he lays on applied psychology. Each of these aspects of the subject is developed at considerable length.

The main body of the work is devoted to scientific psychology; but even here the treatment is out of the ordinary. We miss the usual detailed description of the nervous system and end organs. The author expresses his conviction in the preface that details from accessory sciences such as anatomy do not belong in an outline work on psychology. On the other hand, he believes that psychology should embrace social as well as individual phenomena, and accordingly several chapters are devoted to an examination of mental processes in the social group. Professor Münsterberg does not venture into the field of animal psychology, but he gives considerable prominence to "behavior" in the human sphere. In this connection he points out that tools are human extensions of the motor end-organs, while language is a highly specialized motor function, comparable however with other forms of motor activity.

After defining the scope of psychology in two opening chapters, the author proceeds to the scientific description and explanation of mental events. This aspect of the subject he terms *causal* psychology, to distinguish it from the purposive treatment which follows. More than half of the volume is devoted to the causal presentation, which for most writers constitutes the whole of scientific psychology. This part of the work is exceptionally clear and readable. One is reminded of the author's late colleague, William James, whose interesting style and picturesque illustrations add much to the value of his classic text.

It is to be regretted that Professor Münsterberg has not imitated his predecessor's fullness of treatment as well. In endeavoring to compress his material within too narrow limits he is compelled to curtail the discussion of certain topics unduly. For example, one would desire a more exhaustive examination of imagery, discrimination, abstraction and reasoning than the volume supplies. In this part of the work the author insists on a thoroughgoing scientific procedure. His psychological analysis rests on a rigid psychophysical basis and he aims at a complete mechanistic explanation of mental phenomena through the physiological processes which accompany them.

Professor Münsterberg classifies the elementary psychophysical processes under four heads: stimulation, association, reaction and inhibition; the complex processes include perception, ideas, activity, inner states and personality. A striking feature here is the grouping of actions, attention and thought processes together under the head of *activity*. Inner states are divided into simple feelings of pleasure and displeasure, emotions, and esthetic and intellectual attitudes.

The transition from individual to group processes is made through the study of race, sex, age and individual differences. It may be questioned whether such variations do not belong more properly to comparative than to social psychology; but as the author points out, the differences among individuals facilitate their grouping into social unity. The social grouping itself depends upon three elementary processes: union, submission and aggression. These factors work together and result in the complex social processes of organization and achievement.

The second part of the work is devoted to purposive psychology. Here the object is not to describe the inner life, but to understand its meaning. By a curious *volte-face* the author discards the scientific explanation of mental phenomena which he has hitherto insisted upon rigorously, and considers only their teleological bearings. Psychology regarded from this standpoint is "entirely removed from the world of describable objects and understood as an account of those functions in the personality which point beyond themselves and are felt as deeds of the subject" (46). In connection with this change to the subjective standpoint Professor Münsterberg renames the facts themselves. Instead of psychical elements we have experiences; instead of perception we have immediate reality; ideas become meaning, activity becomes the will.

It is somewhat difficult to grasp the significance of this transformation. Granting that a plexus of ideational elements may be called

meaning, and that a certain plexus of activities constitutes *will,* the scientist may still question the propriety of abandoning the associational basis of meaning or ignoring the causal sequence of volitional acts, as Professor Münsterberg appears to do.

In other sciences the speculative hypotheses which have stood the test of criticism have been attempts to amplify or reconstruct the principles discovered by the science itself, rather than to deny its fundamental generalizations. Professor Münsterberg's reconstruction of psychology, on the contrary, starts out by repudiating the generalizations based on observed temporal sequences, and assuming that the acts of our inner life are not contained in time (301), that "our mental life is free" (296).

It would appear that the author makes altogether too crucial a distinction between *cause* and *purpose.* His interpretation of both terms is open to challenge. The analysis of the *purpose* concept has never been fully carried out, but at least we know that "prevision" and "activity toward an end" admit of biological interpretation in harmony with mechanistic principles. As for causality, the author's use of the concept is not in harmony with Hume's classic analysis, which demonstrated that "necessary" connection is not an essential feature of the causal sequence.

Science to-day generally accepts Hume's conclusions. The chemist and physicist regard the laws of their sciences as merely generalized statements of observed facts. They distinctly refuse to commit themselves as to whether causal sequences *must* be as they actually are. Since Darwin's time most biologists have interpreted the evolution of species and the stages of individual development in the same way. Scientific explanation at the present day does not seek to impose anthropomorphic compulsions upon nature. Nature has been found to be self-consistent in the past; the scientist assumes that the same self-consistency will be observed in the future. The generalized notion of uniformity and self-consistency is all that is implied in the scientific conception of *law.*

Professor Münsterberg interprets the term "law" as involving a "necessary connection" between phenomena. For example, if we have met a man and heard his name, "the law of association makes it necessary that if we meet the man again his name comes to our mind" (22). The author states specifically that "the scientist has a right to claim that all his laws are meant as expressions of causal necessity" (31). Yet this necessary connection is just what most physical scientists plainly disavow. They aim merely to generalize the uniformities of sequence observed in nature.

In any science it is quite legitimate to suggest a working hypothesis which goes beyond the facts and reconstructs them. The electron theory and Mendeleeff's periodic law are such reconstructions of physical and chemical data. So in psychology Professor Münsterberg may find grounds for his theory of "self as a system of purposes." But such a theory should be based on scientific foundations. Instead of two standpoints, the causal and purposive, we should have systematic description of mental phenomena and a suggested reconstruction; the latter should amplify the empirical laws, instead of rejecting them.

The author's attempt to formulate a system of psychology from the teleological standpoint will not appeal to the plain empirical psychologist, because it runs counter to the scientific development of the subject. It transcends the scientific limitations of both cause and purpose. "Necessity" is an anthropomorphic addition to causality. Failing to find any such necessary connection between mental events, the author throws his science to the winds and bases his teleological reconstruction on an equally anthropomorphic interpretation of purpose. The result is perplexing. It is not easy to attach a definite meaning to such statements as "the free act is free because it has no causes" (324). Nor can we take a definite attitude toward the assertion that "we can not imagine a purposive act the meaning of which is not a negation of an opposite purpose" (316).

In the third part of the volume Professor Münsterberg returns to more familiar terri-

tory and discusses the applications of psychology to science and art. He indicates the line of demarcation between psychology and the human sciences as follows: The understanding of mental operations is valuable in the study of history, sociology, etc., but the interpretation of the subject-matter in each case belongs to the special science and not to psychology. In his closing chapters the author considers the applications of psychological data and methods to education, law, economics, medicine and culture. To this applied field he gives the name psychotechnics. These chapters offer a most interesting presentation of the recent progress in applied psychology, a line of development which seems likely to bring about a closer connection between psychology and the professions.

Whether or not the reader agrees with Professor Münsterberg's fundamental positions, he will find the present work most stimulating and suggestive.

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Design of Polyphase Generators and Motors. By HENRY M. HOBART. McGraw-Hill Book Company.

In "Design of Polyphase Generators and Motors," Mr. Hobart takes up the design of a simple three-phase generator and an induction motor from the standpoint of a designing engineer. This occupies the major portion of the book, but there are in addition two chapters devoted to a comparison of synchronous motors and induction motors and to the induction generator. Much useful information and many valuable tables compiled from empirical data obtained from existing machines are included.

The book follows the plan, outlined by the author in its preface, of taking up immediately without any preliminary discussion the design of a three-phase generator of definite rating, introducing the principles involved when required as the design progresses. In addition to the design of a three-phase generator, the design of a polyphase induction motor is also considered. The book should be valuable to the young designer who has a fair knowledge of the principles underlying operation and design of electrical machinery.

It is to be regretted that a portion of the book is not devoted to a simple analytical study of the effect on the operating characteristics of machines of modifying their dimensions and windings in order that the young designer might learn to analyze existing designs and to be able to judge the fitness of any particular design for a definite class of service.

Two appendices give a full bibliography of the papers dealing with polyphase generators and motors which have been printed in the *Proceedings* of the American Institute of Electrical Engineers and in the *Journal* of the British Institute of Electrical Engineers.

RALPH R. LAWRENCE

Synchronous Motors and Converters. By ANDRÉ BLONDEL. Translated from the French by C. O. MAILLOUX. McGraw Hill Book Co. 1913.

"Synchronous Motors and Converters" is a translation of the admirable little book by André Blondel entitled "Moteurs Synchrone à Currents Alternatifs." Several chapters have been added to the translation in order to increase the scope of the book and to bring it up to date. The translation is divided into three parts. Part I. is a translation of the original book with one chapter added by Professor C. A. Adams, of Harvard University. Part II. relates to Rotary Converters and is made of new material by Professor Blondel and a translation of papers presented by him at the Paris Congress in 1900. Professor Adams has also added a chapter to this section relating to the split-pole converter. Part III. contains reprints of papers presented by Professor Blondel at the St. Louis Electrical Congress in 1904, relating to his "two reaction" method of treating the armature reaction of alternators.

The first part of the book takes up the general principles of synchronous motors and a study of their operation under different conditions, and is particularly valuable in giving the development of well-known Blondel bi-